

CLAIMS

What is claimed is:

1. A method of creating a data sequence, comprising:
placing a training sequence at a beginning of a data frame;
5 placing a plurality of the blocks of encoded data within the data frame
following the training sequence; and
interspersing a plurality of submarkers within the encoded data blocks.
2. The method of claim 1 wherein the interspersing of the submarkers
10 comprises interspersing one of the submarkers between two encoded data blocks.
3. The method of claim 1 wherein the interspersing of the submarkers
comprises interspersing each of the submarkers between different pairs of the encoded
data blocks.
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4. The method of claim 1 wherein the interspersing of the submarkers
comprises interspersing one of the submarkers within one of the encoded data blocks.
5. The method of claim 1 wherein the interspersing of the submarkers
20 comprises interspersing each of the submarkers within a different one of the encoded
data blocks.
6. The method of claim 1 wherein the interspersing of the submarkers
comprises copying at least a portion of the training sequence at the beginning of the
25 data frame, and interspersing the copied training sequence between one of the encoded
data blocks.
7. The method of claim 1 wherein the interspersing of the submarkers
comprises copying the training sequence at the beginning of the data frame, and
30 interspersing the copied training sequence between one of the encoded data blocks.

8. The method of claim 1 wherein the interspersing of the submarkers comprises copying at least a portion of the training sequence at the beginning of the data frame, and interspersing the copied training sequence between each of the encoded data blocks.

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9. The method of claim 1 wherein the interspersing of the submarkers comprises copying the training sequence at the beginning of the data frame, and interspersing the copied training sequence between each of the encoded data blocks.

10. A training sequence and submarker insertion apparatus, comprising:
an input adapted to receive a plurality of encoded data blocks; and
an inserter adapted to insert a training sequence before the encoded data blocks
and insert a plurality of submarkers within the encoded data blocks thereby creating a
5 data frame.

11. The training sequence and submarker insertion apparatus of claim 10
wherein the input comprises an input queue.

10 12. The training sequence and submarker insertion apparatus of claim 11
wherein the input queue comprises a first-in-first-out storage device.

13. The training sequence and submarker insertion apparatus of claim 10
further comprising an output adapted to buffer the data frame.

15 14. The training sequence and submarker insertion apparatus of claim 13
wherein the output comprises an output queue.

15 15. The training sequence and submarker insertion apparatus of claim 10
20 wherein the inserter is adapted to insert one of the submarkers between two encoded
data blocks.

16. The training sequence and submarker insertion apparatus of claim 10
wherein the inserter is adapted to insert each of the submarkers between different pairs
25 of the encoded data blocks.

17. The training sequence and submarker insertion apparatus of claim 10
wherein the inserter is adapted to insert one of the submarkers within one of the
encoded data blocks.

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18. The training sequence and submarker insertion apparatus of claim 10 wherein the inserter is adapted to insert each of the submarkers within a different one of the encoded data blocks.

5 19. The training sequence and submarker insertion apparatus of claim 10 wherein the inserter is adapted to insert at least a portion of the training sequence between one of the encoded data blocks in addition to inserting the training sequence at the beginning of the data frame.

10 20. The training sequence and submarker insertion apparatus of claim 10 wherein the inserter is adapted to insert the training sequence between one of the encoded data blocks in addition to inserting the training sequence at the beginning of the data frame.

15 21. The training sequence and submarker insertion apparatus of claim 10 wherein the inserter is adapted to insert at least a portion of the training sequence between each of the encoded data blocks in addition to inserting the training sequence at the beginning of the data frame.

20 22. The training sequence and submarker insertion apparatus of claim 10 wherein the inserter is adapted to insert the training sequence between each of the encoded data blocks in addition to inserting the training sequence at the beginning of the data frame.

25 23. The training sequence and submarker insertion apparatus of claim 10 wherein the inserter is programmable as to the insertion of the submarkers within the encoded data blocks.

30 24. The training sequence and submarker insertion apparatus of claim 23 wherein the inserter is programmable to insert the submarkers between the encoded data blocks or insert the submarkers within the encoded data blocks.

25. A training sequence and submarker insertion apparatus, comprising:
receiving means for receiving a plurality of encoded data blocks;
insertion means for inserting a training sequence before the encoded data
blocks and inserting a plurality of submarkers within the encoded data blocks thereby
5 creating a data frame.

26. The training sequence and submarker insertion apparatus of claim 25
wherein the insertion means comprises an input queue.

10 27. The training sequence and submarker insertion apparatus of claim 26
wherein the input queue comprises a first-in-first-out storage device.

28. The training sequence and submarker insertion apparatus of claim 25
further comprising an output means for buffering the data frame.

15 29. The training sequence and submarker insertion apparatus of claim 28
wherein the output means comprises an output queue.

30. The training sequence and submarker insertion apparatus of claim 25
20 wherein the insertion means comprises means for inserting one of the submarkers
between two encoded data blocks.

31. The training sequence and submarker insertion apparatus of claim 25
wherein the insertion means comprises means for inserting each of the submarkers
25 between different pairs of the encoded data blocks.

32. The training sequence and submarker insertion apparatus of claim 25
wherein the insertion means comprising means for inserting one of the submarkers
within one of the encoded data blocks.

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33. The training sequence and submarker insertion apparatus of claim 25 wherein the insertion means comprises means for inserting each of the submarkers within a different one of the encoded data blocks.

5 34. The training sequence and submarker insertion apparatus of claim 25 wherein the insertion means comprises means for inserting at least a portion of the training sequence between one of the encoded data blocks in addition to inserting the training sequence at the beginning of the data frame.

10 35. The training sequence and submarker insertion apparatus of claim 25 wherein the insertion means comprises means for inserting the training sequence between one of the encoded data blocks in addition to inserting the training sequence at the beginning of the data frame.

15 36. The training sequence and submarker insertion apparatus of claim 25 wherein the insertion means comprises means for inserting at least a portion of the training sequence between each of the encoded data blocks in addition to inserting the training sequence at the beginning of the data frame.

20 37. The training sequence and submarker insertion apparatus of claim 25 wherein the insertion means comprises means for inserting the training sequence between each of the encoded data blocks in addition to inserting the training sequence at the beginning of the data frame.

25 38. The training sequence and submarker insertion apparatus of claim 25 wherein the insertion means comprises means for programming a position of the submarkers within the encoded data blocks.

30 39. The training sequence and submarker insertion apparatus of claim 25 wherein the insertion means comprises means for programming a position of the

submarkers to either insert the submarkers between the encoded data blocks or insert the submarkers within the encoded data blocks.

40. A method of creating a data sequence, comprising:
encoding data into a plurality of encoded data blocks;
creating a data frame comprising a first portion and a second portion, the first
portion preceding the second portion in time;

5 placing a training sequence in the first portion of the data frame;
placing the encoded data blocks in the second portion of the data frame; and
interspersing a plurality of submarkers within the encoded data blocks.

41. The method of claim 40 wherein the interspersing of the submarkers
10 comprises interspersing one of the submarkers between two encoded data blocks.

42. The method of claim 40 wherein the interspersing of the submarkers
comprises interspersing each of the submarkers between different pairs of the encoded
data blocks.

15 43. The method of claim 40 wherein the interspersing of the submarkers
comprises interspersing one of the submarkers within one of the encoded data blocks.

44. The method of claim 40 wherein the interspersing of the submarkers
20 comprises interspersing each of the submarkers within a different one of the encoded
data blocks.

45. The method of claim 40 wherein the interspersing of the submarkers
comprises copying at least a portion of the training sequence in the first portion of the
25 data frame, and interspersing the copied training sequence between one of the encoded
data blocks.

46. The method of claim 40 wherein the interspersing of the submarkers
comprises copying the training sequence in the first portion of the data frame, and
30 interspersing the copied training sequence between one of the encoded data blocks.

47. The method of claim 40 wherein the interspersing of the submarkers comprises copying at least a portion of the training sequence in the first portion of the data frame, and interspersing the copied training sequence between each of the encoded data blocks.

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48. The method of claim 40 wherein the interspersing of the submarkers comprises copying the training sequence in the first portion of the data frame, and interspersing the copied training sequence between each of the encoded data blocks.